ABSTRACT

A method of electroplating a metal layer on a semiconductor device includes a sequence of biasing operations that includes a first electroplating step at a first current density followed by a second immersion step at a second current density being less than the first current density, and subsequent electroplating steps of increasing current densities beginning with a third electroplating step having a third current density that is greater than the first current density. The second, low current density immersion step improves the quality of the plating process and produces a plated film that completely fills openings such as vias and trenches and avoids hollow vias and pull-back on the bottom corners of via and trench openings. The low current density second immersion step produces an electrochemical deposition process that provides low contact resistance and therefore reduces device failure.